

What is claimed is:

- 1 1. Biocompatible particles for delivery of a vaccine to the *pulmonary* system comprising  
2 an immunizing agent; wherein the particles have a tap density less than 0.4 g/ml and at  
3 least 90% of the particles have geometric dimensions between about 5  $\mu\text{m}$  and about 30  
4  $\mu\text{m}$ .
- 1 2. The particles of claim 1 wherein the immunizing agent is selected from the group  
2 consisting of a live attenuated virus or bacterial vaccine, a recombinant virus or bacterial  
3 vaccine encoding an immunizing antigen or a combination of antigens against which  
4 elicitation of an immune response is desired, and an inactivated virus or bacterial vaccine.
- 1 3. The particles of claim 1 combined with large biodegradable carrier particles having a  
2 mass mean diameter in the range of about 50  $\mu\text{m}$  to about 100  $\mu\text{m}$ .
- 1 4. The particles of claim 1 combined with a pharmaceutically acceptable carrier for  
2 administration to the respiratory tract.
- 1 5. The particles of claim 1 wherein at least 90% of the particles have a mass mean  
2 diameter between about 5  $\mu\text{m}$  and about 15  $\mu\text{m}$ .
- 1 6. The particles of claim 1 wherein at least 90% of the particles have a mean diameter  
2 between about 9  $\mu\text{m}$  and about 11  $\mu\text{m}$ .
- 1 7. The particles of claim 1 wherein at least 50% of the particles have a tap density of less  
2 than 0.1 g/cm<sup>3</sup>.
- 1 8. The particles of claim 1 wherein the particles further comprise a polymeric material.
- 1 9. The particles of claim 1 wherein the particles further comprise a non-polymeric  
2 material.
- 1 10. Biocompatible particles for delivery of a targeting molecule to the *pulmonary* system  
2 wherein the targeting molecule is attached to the particles and wherein the particles have

3 a tap density less than 0.4 g/cm.<sup>3</sup>, and at least 90% of the particles have geometric  
4 dimensions between 5 .mu.m and about 30 .mu.m.

1 11. Biocompatible particles for delivery of a vaccine agent to the *pulmonary* system  
2 comprising an immunologically effective amount of a vaccine agent; wherein the  
3 particles have a tap density less than 0.4 g/cm.<sup>3</sup> and at least 90% of the particles have  
4 an aerodynamic diameter between about 1 .mu.m and about 5 .mu.m.

1 12. The particles of claim 11 wherein the agent is selected from the group consisting of  
2 viral vaccines, bacterial vaccines, live, attenuated, recombinant, inactivated, and  
3 combinations thereof.

1 13. The particles of claim 11 combined with large biodegradable carrier particles having  
2 a mass mean diameter in the range of about 50 .mu.m to about 100 .mu.m.

1 14. The particles of claim 11 combined with a pharmaceutically acceptable carrier for  
2 administration to the respiratory tract.

1 15. The particles of claim 11 wherein at least 90% of the particles have an aerodynamic  
2 diameter between about 1 .mu.m and about 3 .mu.m.

1 16. The particles of claim 11 wherein at least 90% of the particles have an aerodynamic  
2 diameter between about 3 .mu.m and about 5 .mu.m.

1 17. The particles of claim 11 wherein at least 50% of the particles have a tap density of  
2 less than 0.1 g/cm.<sup>3</sup>.

1 18. The particles of claim 11 wherein the particles further comprise a polymeric material.

1 19. The particles of claim 11 wherein the particles further comprise a non-polymeric  
2 material.

1 20. Biocompatible particles for delivery of a vaccine and targeting molecule to the  
2 *pulmonary* system wherein the targeting molecule is attached to the particles and wherein  
3 the particles have a tap density less than 0.4 g/cm.<sup>3</sup>, and at least 90% of the particles  
4 have an aerodynamic diameter between about 1 .mu.m and about 5 .mu.m.

- 1 21. A method for delivery of an actively immunizing amount of a vaccine to the  
2 *pulmonary* system comprising: administering to the respiratory tract of a patient in need  
3 thereof of an effective amount of biocompatible particles incorporating said vaccine,  
4 wherein the particles have a tap density of less than about 0.4 g/cm.<sup>3</sup> and at least  
5 90% of the particles have geometric dimensions between about 5 .mu.m and about 30  
6 .mu.m.
- 1 22. The method of claim 21 wherein the agent is selected from the group consisting of  
2 viral vaccines, bacterial vaccines, live, attenuated, recombinant, inactivated, and  
3 combinations thereof.
- 1 23. The method of claim 21 wherein the particles are combined with large biodegradable  
2 carrier particles having a mass mean diameter in the range of about 50 .mu.m to about  
3 100 .mu.m.
- 1 24. The method of claim 21 wherein the particles are combined with a pharmaceutically  
2 acceptable carrier for administration to the respiratory tract.
- 1 25. The method of claim 21 wherein at least 90% of the particles have a mass mean  
2 diameter between about 5 .mu.m and about 15 .mu.m.
- 1 26. The method of claim 21 for delivery to the alveolar zone of the lung wherein at least  
2 90% of the particles have a mean diameter between about 9 and about 11 .mu.m.
- 1 27. The method of claim 21 wherein at least 50% of the administered particles have a tap  
2 density of less than about 0.1 g/cm.<sup>3</sup>.
- 1 28. The method of claim 21 wherein the particles further comprise a polymeric material.
- 1 29. The method of claim 21 wherein the particles further comprise a non-polymeric  
2 material.
- 1 30. A method for delivery of a vaccine and a targeting molecule to the *pulmonary* system  
2 comprising: administering to the respiratory tract of a patient in need of treatment,  
3 prophylaxis or diagnosis an effective amount of biocompatible particles, wherein the  
4 particles have a tap density less than about 0.4 g/cm.<sup>3</sup> and at least 90% of the  
5 particles have geometric dimensions between about 5 .mu.m and about 30 .mu.m, and

31. A method for delivery of a vaccine to the *pulmonary* system comprising:  
administering to the respiratory tract of a patient in need thereof of an effective amount of  
biocompatible particles comprising said vaccine, wherein the particles have a tap density  
of less than about 0.4 g/cm<sup>3</sup> and at least 90% of the particles have an aerodynamic  
diameter between about 1 .mu.m and about 5 .mu.m.

1 32. The method of claim 31 wherein the agent is selected from the group consisting of  
2 viral vaccines, bacterial vaccines, live, attenuated, recombinant, inactivated, and  
3 combinations thereof.

1 33. The method of claim 31 wherein the particles are combined with large biodegradable  
2 carrier particles having a mass mean diameter in the range of about 50 .mu.m to about  
3 100 .mu.m.

1 34. The method of claim 31 wherein the particles are combined with a pharmaceutically  
2 acceptable carrier for administration to the respiratory tract.

1 35. The method of claim 31 wherein at least 90% of the particles have an aerodynamic  
2 diameter between about 1 .mu.m and about 3 .mu.m.

1 36. The method of claim 31 for delivery to the alveolar zone of the lung wherein at least  
2 90% of the particles have an aerodynamic diameter between about 3 .mu.m and about 5  
3 .mu.m.

1 37. The method of claim 31 wherein at least 50% of the administered particles have a tap  
2 density of less than about 0.1 g/cm<sup>3</sup>.

38. The method of claim 31 wherein the particles further comprise a polymeric material.

1 39. The method of claim 31 wherein the particles further comprise a non-polymeric  
2 material.

40. A method for delivery of a vaccine and a targeting molecule to the *pulmonary* system comprising: administering to the respiratory tract of a patient in need of treatment, prophylaxis or diagnosis an effective amount of biocompatible particles comprising said

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- 4 vaccine, wherein the particles have a tap density less than about 0.4 g/cm.<sup>3</sup> and at  
5 least 90% of the particles have an aerodynamic diameter between about 1 . $\mu$ m and  
6 about 5 . $\mu$ m, and wherein the targeting molecule is attached to the particles.

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